# THE SECTION ON METEOROLOGY OF THE INTERNATIONAL GEODETIC AND GEOPHYSICAL UNION



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In view of the meeting of the International Geodetic and Geophysical Union at Madrid, October 1–8, 1924, readers of the REVIEW may be interested in a summary of the scientific activities of the Section on Meteorology since the meeting of the Union in Rome in May, 1922. This summary is based on the report of the Executive Committee of the Section for 1922–1924, the committee being composed of the following persons: President, Sir Napier Shaw; vice presidents, Dr. C. F. Marvin and Col. E. Delcambre; secretary, Prof. Filippo Eredia; and members G. C. Simpson, A. Wallén and P. Gamba. The program of the Madrid meeting includes the consideration not only of the matters dealt with in the report here summarized, but of a large number of other proposals, from the various National Committees of the Union, which were not included in the report. In order to indicate the scope of the discussion at the meeting, these latter items will be given after the summary.

The following scientific matters receive attention in the report of the executive committee:

1. Cloud investigations.
2. Applications of modern statistical method to meteorological data.
3. Composition of the air in the upper atmosphere.
4. Exploration of the upper air.
5. Atmospheric dust.
6. Solar radiation.
7. Methods of weather forecasting in various countries.
8. Convection.
9. Relation of sunspots to terrestrial magnetism and the weather.
10. Relation between the Section on Meteorology of the International Geodetic and Geophysical Union and the International Meteorological Committee.
11. International publication of upper air data.
12. Exchange of publications.

*Cloud investigations.*—At the Rome meeting in 1922 the Section adopted a resolution to the effect that members of the Union interested in problems concerning cloud types be asked to submit suggestions as to matters for investigation to the Commission newly appointed by the International Meteorological Committee for the purpose of carrying out cloud studies from the points of view of pure and applied meteorology. This Commission was continued at the Utrecht meeting of the International Meteorological Committee, Colonel Delcambre being elected its president to fill the vacancy left by the retirement of Sir Napier Shaw.

*Application of modern statistical method to meteorological data.*—This matter the Section referred to the International Meteorological Committee for action. Though that committee has not met for the purpose of considering scientific matters since May, 1922, the International Commission on Agricultural Meteorology secured the adoption at the Utrecht conference of the following resolution: "The Commission recommends for studies in agricultural meteorology the use of frequency values and values for the duration of specified temperatures, humidity, etc., as determined by the individual countries."

A proposal by the Italian National Committee for a joint meeting of the Section on Meteorology with the Section on Hydrology for the purpose of discussing modern statistical methods, was made an order of the day for the Madrid meeting. The Italian Committee will send to the national committees a memorandum summarizing the various methods with their practical applications.

*Composition of the air in the upper atmosphere.*—A redetermination of the hydrogen content of the atmosphere appearing to be desirable, the president has taken steps to determine the procedure necessary. Doctor Onnes, of the University of Leyden, and Professor Lindemann, of Clarendon Laboratory, Oxford, have hopes of making very exact determinations of the hydrogen content of air samples from widely different localities and from various altitudes, by means of low-temperature methods. If the content be found to vary, either as between localities or at different hours in the same locality, atmospheric hydrogen would appear to be of local origin, and its universal diffusion through the atmosphere therefore improbable. It is proposed that the section ask the Chemical Union to carry out determinations of this content from time to time by low-temperature methods in places where facilities are available. Cooperation to this end by the chemists of various countries would make possible an answer to the question as to whether hydrogen in definite proportion is a normal constituent of the lower atmospheric strata, before attack is made on the problem of what steps are necessary to obtaining air samples from the upper strata.

Observation on meteors discussed by Lindemann and Dobson (Proc. Roy. Soc., 102, No. A. 717, January, 1923), show that the assumption of the existence in the high atmosphere of a gas lighter than hydrogen is unnecessary. Furthermore, spectroscopic study of the upper atmosphere by specialists in that field (Rayleigh, Fowler, Vegard) give no evidence of the presence of hydrogen in the upper layers up to the height of the atmosphere determined by the visible aurora. Vegard suggests that the typical green line in the spectrum of the aurora even at the greatest heights may be due to nitrogen in a modified physical state and not at all to hydrogen or helium.

*Exploration of the upper air.*—Proposal has been made that the cooperation of aero clubs and yacht clubs be asked in upper-air exploration by means of sounding balloons. Pursuant to this end the following steps have been taken:

(*a*) The assembly of details as to apparatus useful in sounding and pilot-balloon work at sea and on deserts. Information has been collected on types of balloons and meteorographs adaptable to use by persons interested in carrying out such studies.

(*b*) Instruction in the details of observational procedure adapted to use by persons perhaps not very familiar with meteorological methods was found necessary, and for this purpose reprints of the section in de Bort and Rotch's memoire dealing with the technique of observations at sea, with English translation, have been made.

(*c*) The form of request to ships has received attention, the superintendent of navy services at the British Meteorological Office, Commandant Garbett, collaborating.

(*d*) This official also designed and tested a model float for the purpose of sustaining the balloon and meteorograph after descent. The device was found thoroughly satisfactory.

(e) Tests have also been carried out on methods of using the sextant (in place of the theodolite) in following the flight of balloons at sea, this work being based on the paper by Wegener and Kuhlbrodt (Archiv der Deutschen Seewarte, 40, Jahrg. 1922, No. 4) on that subject.

*Atmospheric dust.*—Acting upon resolution by the Section at the Rome meeting, Owen's dust counters have been distributed by the Section office to the following countries, with the expectation that results would be reported to the office: Australia, Belgium, Brazil, Canada, France, Great Britain, Greece, Italy, Poland, Portugal, Roumania, Spain, Sweden, and the United States, together with one to Professor Gamba of the executive committee. The office suggested that the days chosen for dust observation be those already designated as international days for upper-air work. Doctor Kimball, in charge of the observations at Washington, arranged for the obtaining of dust samples from high altitudes by means of airplanes, the first trial being carried out on April 6, 1923. Doctor Wallén, director of the meteorological-hydrographical organization at Stockholm, proposes to use the same method.

Of observations at the earth's surface, the committee has received from Washington a complete set for every international day beginning with January, 1923, together with details of observations on the 4th and 5th of January, 1923 at Uccle, and observations from Greece. In the latter cases much difficulty in determining the count has arisen from the lack of suitable microscopes. Australia also reports difficulty on this score. It is believed that a high powered microscope, though not a part of the usual meteorological equipment, should be available for the work in each case, and that it could perhaps be loaned from the apparatus of related scientific institutions. It is held desirable that the Section authorize some communication on this point with member countries.

Professor Gamba has sent to the president a sample of a visibility gage of his own design. This instrument is described in his paper "le osservazioni della nebbia ed il *nefelemetro* Gamba," (Bollettino bimensile della Societa meteorologica Italiana, 4–6 November, 1921). An uncompleted instrument designed for the same purpose and consisting of several plates of clouded glass, to be held between the observer and the distant object, is available at London, but to date no comparison of the two has been made.

*Solar radiation.*—The Section office hopes to be able to distribute at the Madrid meeting a report on the state of our knowledge concerning solar, earth, oceanic and atmospheric radiation, and their bearing on the general circulation of the atmosphere.

Ladislas Gorczyński, Director of the Polish Meteorological Service, recently returned from the Far East, presented at the Utrecht Congress in September, 1923, a brief report on the results of this expedition, undertaken for the study of the intensity and character of solar radiation in equatorial regions. This report is published in Comptes Rendus for October 22, 1923, p. 754. Gorczyński suggests that this reconnaissance study be followed by others in various parts of the globe, for the investigation of partial intensities of the solar radiation, especially on low latitude mountain peaks (British India, South America), in deserts (mountainous parts of the Sahara, Morocco, plains of Egypt) and also on a small oceanic island. The instruments required for such expeditions will probably be exhibited by Gorczyński at Madrid.

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The British national committee has submitted the following recommendation at the instance of Mr. F. L. Richardson: "That the section should take steps to obtain observations from aeroplanes upon the luminosity reflected from the earth's surface as compared with that from a cloud, using an *iris-photometer*, of which a scale drawing is submitted."

*Methods of forecasting in various countries.*—In accordance with a resolution by the Section, a circular letter of inquiry as to the methods of forecasting in use by individual countries was sent in January, 1923, to the directors of the meteorological services of countries belonging to the Union and to countries which had been invited to join the International Research Council. By the middle of July, 1923, 16 replies had been received. It was therefore decided to issue to the different countries a pamphlet containing all the replies.

In this connection, Colonel Delcambre has pointed out that one of the objects of the letter was to seek international exchange of ideas with a view to arriving at complete agreement on the International Code used in the transmission of meteorological reports. He expressed the belief that the short statements asked for and received were inadequate for this purpose, and referred to treatises such as that by J. Bjerknes and H. Solberg as examples of the fullness of treatment desirable. Similar extended statements are in print on the methods in use at the British Meteorological Office (Shaw: Forecasting Weather, 2d ed., October, 1923) and in the United States (Henry, Bowie, Cox, and Frankenfield: Weather Forecasting in the United States, Washington, 1916). Schereschewsky and Wehrle's "Cloud Systems" is a contribution from the French Meteorological Office of interest in this connection.

The Section office decided to send forward the pamphlet above referred to, and to bring before the Section at Madrid the question of ways and means of attaining the ideal set forth by Colonel Delcambre.

*Convection.*—The committee reports that no move has been made to ask international cooperation in this matter. A statement of the problem and of methods for its solution is presented in a paper in the Quarterly Journal of the Royal Meteorological Society for January, 1924, under the title: "Resilience, cross-currents, and convection." Copies of this paper will be distributed at an appropriat time.

*Relation of sunspots to terrestrial magnetism and the weather.*—In view of the fact that spots and terrestrial magnetism are related, but that a connection between spots and weather has not yet clearly been made out, the British national committee has, at the suggestion of Dr. Chree, president of the section on terrestrial magnetism and atmospheric electricity, made the proposal: "That the section should arrange for an examination of weather experienced on *quiet* magnetic days as compared with that experienced on *disturbed* days."

*Relation between the Section on Meteorology of the International Geodetic and Geophysical Union and the International Meteorological Committee.*—The Union having asked that the International Committee consider the question as to whether or not there was duplication of functions between the two bodies, and if so what measures to prevent it could be devised, the Conference of Directors very carefully went over the matter at its meeting in Utrecht in September, 1923, and as a result came to the conclusion, embodied in a resolution, that such duplication did not exist. It is pointed out that the purpose of the International Committee is solely to consider

matters that concern the operation of the respective systems of stations as such and hence are of interest to all governmental meteorological services. The Conference of Directors offered thorough cooperation, and expressed the hope that the Union would as soon as possible enroll representatives from all nations, as the International Committee had done.

By way of indicating clearly the nature of membership in the Committee, a former ruling of the Conference of Directors was reworded thus: "The office of the International Committee shall invite in person to meetings all the directors of governmental meteorological organizations, separate invitations being sent to the directors in each country." Thus regular membership in the Committee is limited strictly to chiefs of government meteorological services having systems of stations under their direction. On the other hand, it is intended that the Union shall also include directors of public and private observatories engaged in meteorological research, but not under the direction of any government bureau; and that, concerning matters of more general scientific interest, plans for international cooperation shall be referred to the Union. Dr. Simpson has asked that this matter also be considered by the International Committee (as distinguished from the Conference of Directors).

*International publication of upper air data.*—This matter has a bearing on the relations just discussed. The Union's Commission on upper air exploration is giving attention to the publication of upper air data in accordance with its (the Commission's) recommendation at Bergen in 1921 that "the preparation and publication of data should be under the direction of an office and that the expenses of this office should be paid by international contribution." Inquiries sent to institutions in various countries have not resulted in their indicating definitely the amounts they would contribute.

In the opinion of the executive committee, it is not desirable to ask a contribution for a specific meteorological undertaking of a country which makes a yearly contribution to the Union. The question as to whether the Union should help defray the expenses of one year's issue as a model of the kind of publication intended will be brought before the section meeting at Madrid. It may be noted that the Section on Meteorology possesses a principal of 32,542 fr. and an annual income of 22,400 fr. The latter amount should by the time of the meeting come to 44,800 fr. Thus the Union could make a contribution toward the printing of the upper-air data in the name of the member countries without prejudicing future discussion of the matter.

*Exchange of publications.*—The office of the International Geodetic and Geophysical Union, in a letter on the exchange of publications between the International Research Council and a committee of the League of Nations, has suggested that the publications of the Section on Meteorology be sent to the Secretary of the International Committee on Intellectual Cooperation, Office of the League of Nations, Geneva, in exchange for certain publications of the League of Nations.

This raises a question concerning places where section members could find available any publications received in exchange. Since the answer to this question depends on what provision it is proposed to make for the housing of the property of the Research Council and of its various unions, the following proposal has been made an order of the day for the Madrid meeting: "That the Union should take steps to obtain from the Research Council a statement as to the libraries, in the different countries, in which the publications of the Unions should be assembled, as well as publications received in exchange for those presented to other organizations."

The proposals of the National Committees not included in the report of the Executive Committee, but which form a part of the agenda for the Madrid meeting, are given below:

*Belgium.*—(*a*) A method of counting dust particles on the Owens cover glasses against a black background without immersion.

(*b*) The technique of aerological soundings.

*United States.*—(*a*) The preparation of a Northern Hemisphere daily weather map.

(*b*) The organization of a study of the atmospheric circulation of the globe, including the genesis of cyclones and anticyclones.

(*c*) The extension of pilot and sounding balloon observations to the Arctic and to the Tropics.

(*d*) Improvement of the Gregorian calendar.

(*e*) Proposals to promote the investigation of meteorological phenomena.

(*f*) Possible methods of exploring the upper air to heights beyond those already attained by sounding balloons.

(*g*) The problem of atmospheric dust, turbidity, etc.

(*h*) Cloud classification (*a*) for scientific study; (*b*) for use in daily weather reports.

*Great Britain.*—(Included in report of Executive Committee.)

*Greece.*—(*a*) Systematic exploration of the [atmosphere over the] Mediterranean Sea.

(Other matter included in report of Executive Committee).

*Italy.*—(*a*) The measurement of cloud heights.

(*b*) Systematic exploration of the atmosphere over the Mediterranean Sea.

(Other matter included in report of Executive Committee.)

*Switzerland.*—Communication by Prof. A. deQuervain "On the high-altitude scientific station at 3,500m. on the Jungfrau summit." (Illustrated.)

"This station, which will have the advantage of being accessible during almost the entire year, should primarily serve meteorology and geophysics, but also astronomy and physiology. Built by Switzerland and directed by a Swiss scientific committee, it will in principle be open to scientists of all nations. On this account it appears to be of sufficient international interest for an account of its present status and future prospects to be presented before the Section on Meteorology of the Congress."